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# Southern Pine Beetle

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CURRENT SERIAL RECORDS

The southern pine beetle (*Dendroctonus frontalis* Zimmerman) is one of the most destructive insect enemies of pine in the Southern United States, Mexico, and Central America. Because of the suddenness with which populations build up to outbreak proportions and the amount of timber killed, this is the insect that southern forest managers fear most.

The beetle occurs from Pennsylvania to Texas and from New Mexico and Arizona to Honduras (fig. 1). During a single epidemic in Honduras in 1962-64, it killed about 10 billion board feet of pine timber. In the Southeastern United States, epidemics are restricted to more or less well-defined areas, where they have occurred at irregular intervals at least since the late 19th century. Here, average annual timber mortality caused by the beetle exceeds 100 million board feet of sawtim-

ber and 20 million cubic feet of growing stock.

Infestations of pine engraver beetles (*Ips* spp.) and the black turpentine beetle (*Dendroctonus terebrans* (Olivier)) frequently initiate or become associated with southern pine beetle outbreaks. Trends in populations of the southern pine beetle are hard to predict, and between epidemics the insect almost disappears.

## Hosts

In the Southeast, the southern pine beetle attacks all species of yellow pines. It seems to prefer loblolly, shortleaf, Virginia, and pitch pines to slash and longleaf pines. It also attacks white pine, red spruce, and eastern hemlock but does little damage to these species.

## Evidence of Attack

The first sign of an infestation usually is discoloration of tree crowns. Needles become yellowish, then change to a sorrell color,

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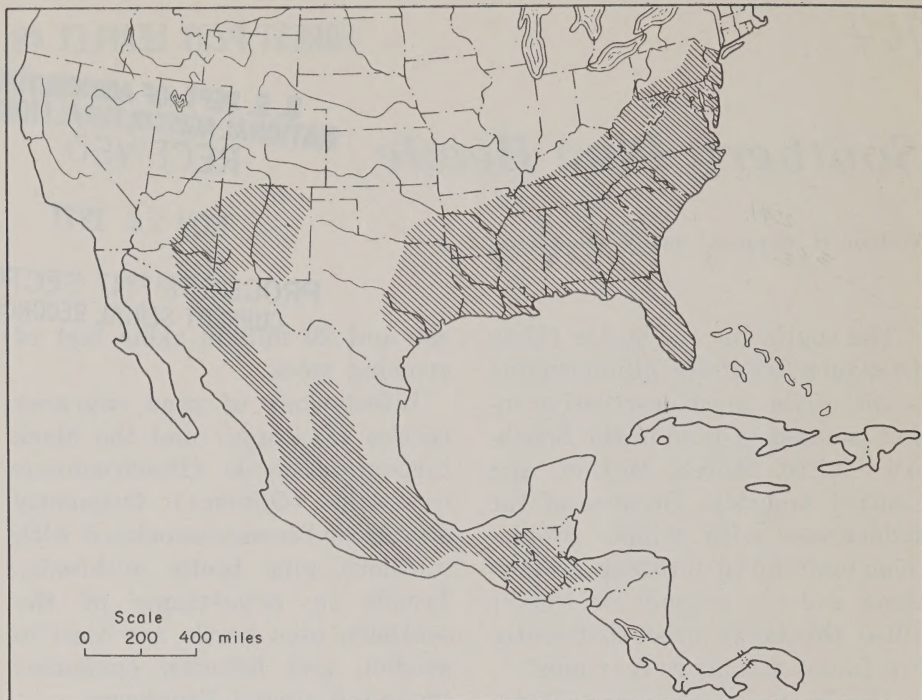


Figure 1.—Range of the southern pine beetle in North and Central America.

and in about  $1\frac{1}{2}$  to 2 months turn reddish brown. Typically, pines are killed in groups ranging from a few trees to several hundred acres of trees.

Pitch tubes—small yellowish-white masses of resin,  $\frac{1}{4}$  to  $\frac{1}{2}$  inch in diameter—mark the points of beetle entry. In unusually dry weather, there may be no pitch but only reddish boring dust lodged in bark crevices or in cobwebs at the base of an infested tree. Removal of a section of bark from an infested pine will reveal S-shaped egg galleries that criss-cross one another on the inner bark and the wood surface (fig. 2). These serpentine tunnels clearly distinguish the southern pine beetle from any other pine bark beetle in the Southeast.

If the attack is recent, there will be some adult beetles in the galleries, or very tiny, whitish larvae will be visible in threadlike mines that extend from the galleries. In older attacks, most of the brood will be concealed within the bark but may be exposed by sectioning the bark with a machete or hatchet.

Beetle broods complete their development in about a month and leave by tunneling through the bark to the outside. Their exit holes resemble those made by birdshot (fig. 3). From spring to late fall, emergence takes place about the time affected trees begin to fade; during mild periods in winter, emergence may occur at any stage of crown coloration, from green to red.





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Figure 2.—Winding egg galleries made by the southern pine beetle in inner bark.  
Dark areas have been infected by blue-stain fungi carried by the beetle.





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Figure 3.—Emergence holes of southern pine beetle adults may number several hundred per square foot of bark.

### Life History

The southern pine beetle is short-legged, stout, and about  $\frac{1}{8}$  inch long (fig. 4, *D*). The forepart of its head is notched, and the hind end of the body is rounded. Mature beetles are dark reddish brown, and their hard outer wings

are a lighter shade than the forepart of their bodies. The young adult beetle is soft bodied and amber colored but soon hardens and darkens as it becomes sexually mature.

Beetles attack in pairs of male and female. When populations are large, many thousands of pairs may invade a single tree. Each pair constructs a winding gallery between the bark and the wood, and the pearly white eggs, just visible to the naked eye (fig. 4, *A*), are deposited in niches along the sides. The galleries, which frequently meet or cut across one another, girdle the tree. Blue-stain fungi carried by the beetles hasten the tree's death by plugging the conductive tissue.

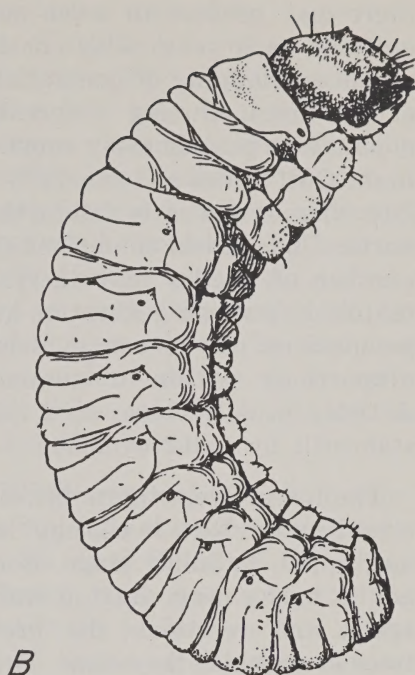
The egg hatches into a whitish, legless larva with a glossy, reddish-brown head; the body is wrinkled and curved and, when fully developed, is about  $\frac{1}{8}$  inch long (fig. 4, *B*). Newly hatched larvae mine in the soft inner bark; older larvae mine outward into the corky area. When fully grown, the larva changes to the resting stage, or pupa (fig. 4, *C*), which is pure white and very fragile.

When pupation is complete, the young adults chew exit holes through the bark, take flight, and invade green trees in the vicinity.

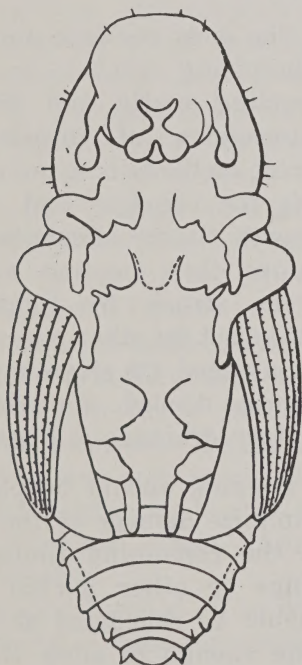
In the Southeast, overwintering broods reach maturity, emerge, and begin to attack uninfested trees about the time flowering dogwood is in full bloom. Depending upon latitude and elevation,



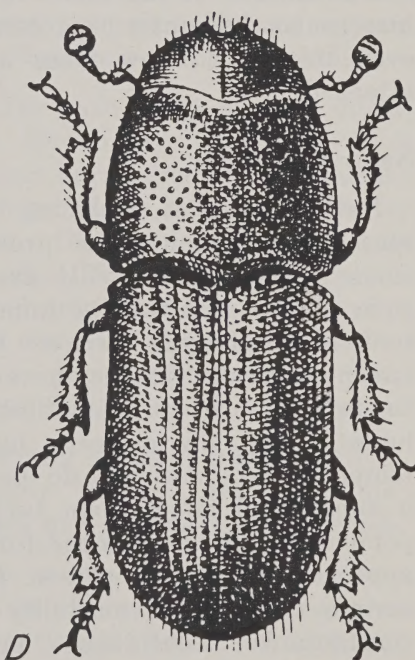
A



B



C



D

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Figure 4.—Stages of the southern pine beetle: A, Egg; B, larva; C, pupa; D, adult.



there may be four to seven generations each year, with considerable overlapping of generations at all times. During outbreaks, populations peak in early summer in the Gulf States and generally in late summer and early fall farther north. Under ideal conditions the number of beetles may increase tenfold in a single generation and populations may reach epidemic proportions within a summer. Activity usually comes to a near standstill by mid-November.

The insect overwinters beneath or within the bark in the egg, larval, pupal, or adult stage. Some adults may emerge during warm spells and re-attack the brood trees from which they came. Thus, concentrations of the beetle may increase as the winter progresses, even though no new trees are attacked.

### **Natural Enemies**

Natural enemies, including diseases and parasitic and predacious insects, undoubtedly exert some control and may be important in prolonging periods between outbreaks, but they have so far failed to prevent heavy timber losses. Very low or very high temperatures, however, do have a substantial effect upon beetle populations. When temperatures approach 0° F. and persist for several days, brood mortality is considerable. Continuous daily temperatures in excess of 100° F. tend to kill broods in the Gulf States.

### **Silvicultural Control**

Most beetle attacks occur in stands where trees are so crowded that their vigor is low. Often in such infested stands, soil and moisture conditions are excellent for tree growth, but examination of infested trees will invariably indicate a general decline in vigor, manifested by a recent reduction in diameter growth.

If stands of low vigor are weakened additionally, as by drought, flooding, or careless logging, they become susceptible to attack by the beetle. Once heavy populations develop in weakened trees, the beetles may spread to adjacent trees that might otherwise have escaped attack.

The most realistic approach to minimizing timber losses and avoiding costly and short-term suppression of infestation by direct methods is to manage forests for vigorous and sustained growth. Stands should be thinned before they become overdense. Trees struck by lightning or weakened by other causes should be salvaged. On sites that are frequently flooded, improvement of surface drainage is beneficial.

Logging should be planned to minimize damage to the site and to the remaining timber. Thinnings or other partial cuttings should be scheduled at intervals long enough to allow the stands to recover. Logging machinery should be operated carefully; heavy equipment is prone to com-



compact the soil or crush tree roots, especially when the soil is wet. Roads and trails should be planned and built in ways that avoid causing erosion, flooding, or changes in the water table. Trees that are bruised or skinned by heavy equipment should be salvaged.

### **Direct Control**

The primary object of direct control is to reduce the beetle population to a low level as rapidly as possible.

Infestations can be best detected from low-flying aircraft. In regions of chronic high hazard or in years when epidemics are feared, the USDA Forest Service, State agencies, and industrial landowners make aerial detection surveys over extensive forest areas, often including many ownerships. These surveys may be conducted from an altitude of 1,000 feet. Two trained observers, one on each side of the aircraft, search for groups of red-topped and fading pines. Groups located from the air are examined on the ground to confirm the presence of the southern pine beetle. Because it is difficult to predict the course of infestations, presuppression surveys are usually made at 3- to 4-week intervals from April through October.

The cheapest method of control is to sell infested trees for removal. Trees containing beetle broods should be removed first and promptly. Removal of a ring of

uninfested trees along the periphery of small outbreak spots often minimizes the hazard of reinfestation and may help to make a salvage program economically feasible. Particularly when outbreak spots are widely scattered, loggers may not be able to operate profitably unless they get a truckload of wood from each spot. Infested trees should be sawn or chipped immediately at the mill, and slabs and bark should be utilized or burned.

Where removal of trees by commercial sales is not possible, beetle broods may be killed by felling infested trees and spraying the bark with lindane in No. 2 fuel oil. A lindane spray may be prepared by adding 1 gallon of 20-percent emulsifiable concentrate to 27 gallons of No. 2 fuel oil.

The entire bark surface should be thoroughly wetted with a coarse spray from a low-pressure sprayer. Logs must be turned so that the undersides can be reached. The spray should be applied only when the bark is dry. On wet bark the oil will tend to stay in droplets rather than spreading.

Piling infested trees and thoroughly burning the bark also gives good control of beetle broods.

It is most important to re-examine treated areas. Trees that have recently become infested are often difficult to detect and are sometimes overlooked during initial treatment. They may serve as

a source of continuing infestation. Areas treated from April through October should be checked at 2- or 3-week intervals for 9 weeks following initial treatment, and all additional infested trees should be removed or sprayed. Examinations at intervals of 8 weeks are sufficient for areas treated during the winter.

### **Pesticide Precautions**

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key—out of the reach of children and animals—and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or when they may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or

gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly. Take care to avoid prolonged contact of lindane with the skin. The chemical may be absorbed by the skin and produce harmful effects.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush them and bury them in a level, isolated place.

**WARNING:** Recommendations for use of pesticides are reviewed regularly. The registrations on all suggested uses of pesticides in this publication were in effect at press time. Check with your county agricultural agent, State agricultural experiment station, or local forester to determine if these recommendations are still current. Some States have restrictions on the use of certain pesticides; check your State and local regulations.